

**Before the  
Federal Communications Commission  
Washington, D.C. 20554**

In the Matter of:

Proposed Amendments to the Service Rules	)	
Governing Public Safety Narrowband Operations	)	PS Docket No. 13-87
in the 769-775/799-805 MHz Bands	)	
 National Public Safety Telecommunications Council	)	
Petition for Rulemaking on Aircraft Voice Operations	)	RM-11433
at 700 MHz	)	
 National Public Safety Telecommunications Council	)	
Petition for Rulemaking to Revise 700 MHz	)	RM-11433
Narrowband Channel Plan	)	
 Region 24 700 MHz Regional Planning Committee	)	WT Docket No. 96-86
Petition for Rulemaking	)	PS Docket No. 06-229
 State of Louisiana Petition for Rulemaking	)	RM-11577

**Comments of  
The Pennsylvania State Police**

The Pennsylvania State Police (PSP) herein submits limited comments in response to the above referenced proceedings. These comments are limited to a response to the issue of Vehicular Repeater Systems (VRS) in the 700 MHz band and the need to trunk such VRS operations in compliance with Section 90.537 of the Commission's rules<sup>1</sup>. PSP contends that VRS operations achieve spectral efficiency goals outside of the realm of a trunking requirement. To provide a comparable level of coverage over a large geographic area would require many more sites, which would require more frequencies and significantly increase the cost of a statewide radio system. Vehicular repeaters are capable of more aggressive frequency reuse than high sites and can support hundreds of portable users on a single frequency thus achieving a high level of spectral efficiency.

**Trunking as a Spectrally Efficient Operation**

The concept of trunking is that a limited number of co-located transmitters can be associated and controlled within a radio network in such a way that RF frequencies are assigned on as needed basis to a greater number of subscriber units. Each group of subscriber units enjoy

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<sup>1</sup> FCC 16-111 para 30 – 34 inclusive

discrete communication channels using a fewer number of RF frequencies than would be needed if each group of subscribers were to be assigned a unique RF channel. Thus, a limited number of RF channels installed and operational at a fixed site are able to service a significantly greater number of communication channels. The basis of trunking is that a centralized controller is able to select an open RF channel and direct subscribers to that channel through RF signaling. The fixed infrastructure has a selection of RF channels from which to choose, such that the subscriber group may not necessarily utilize the same RF channel for multiple exchanges of communication.

Such utilization of available “open air” time results in increased spectral efficiency and the ability to fully utilize the limited spectral resource. The spectral efficiency increases exponentially with the number of RF channels, allowing greater subscriber loading without receiving system busy alerts.

### **Why VRS should be excluded from Trunking Requirements**

Centralized trunking utilizes multiple RF transmitters at a fixed location, each operating on a discrete RF frequency. Typical trunked configuration is composed of a single control channel along with dynamically assigned multiple traffic channels. The trunking controller acts as a system monitor that allocates a subscriber or group of subscribers to affiliate on a specific unused RF frequency. The efficiency of trunking exists where the subscriber groups exceed the number of RF frequencies. In such a situation, an unoccupied RF frequency is assigned for a specific conversation.

A VRS unit is installed into a vehicle and operates with a single RF transmitter. The VRS unit has a complement of several available RF channels and will select an unoccupied RF channel for the purpose of affiliating with a subscriber or multiple subscribers. VRS operation does not require an additional control channel.

Having only a single RF transmitter, a VRS unit does not meet the basic requirement of trunking, which is to have the ability to utilize one of multiple RF frequencies to enable several simultaneous conversations.

At times, multiple vehicles may converge at the same location. In this scenario the VRS acts as a decentralized controller, where each VRS unit will detect the presence of the other units and determine if a VRS operation has been activated. Handheld subscriber units will affiliate with an established VRS unit and not activate an additional RF frequency. This decentralized control does, in a way, resemble trunking in that shared use of an existing VRS operation is encouraged through local decentralized management.

The Commission's rule requiring that six or more RF frequencies be trunked is not directly applicable to VRS operations. The rule envisions a fixed location where there are six or more RF transmitters, each capable of operating simultaneously. These transmitters are controlled by a centralized trunking controller that allots subscribers and subscriber groups to talk channels utilizing the available RF channels. Trunking should not be construed to incorporate vehicular single-frequency transmitters that may have the ability to transmit on several RF channels, one at a time. Further, where multiple vehicles from the same or different fixed infrastructures converge at a location, there is no method of synchronizing the possible RF transmitters, other than decentralized control.

It is incorrect to equate a single transmitter in a vehicle with six or more transmitters at a fixed location, even if the vehicular transmitter has the ability to selectively transmit on one of six or more frequencies, one at a time, or if there are multiple vehicles in the same vicinity.

### **Special Consideration for State Use Channels**

As part of the 700 MHz allocation of narrowband spectrum, a portion of the band was allotted to the Governor of each state and territory of the United States, along with the District of Columbia. This set-aside of channels was provided without restriction as to fixed station location, provided each entity coordinated with surrounding entities to prevent interference along common borders. The issue of spectral efficiency is not as significant in the state use allocation because this spectrum is not available to any other user within the state other than the state itself. Spectral efficiency is not an issue unless there is competition for the spectrum where the available spectrum cannot meet the requirements of diverse eligible licensees. The "state use" spectrum has only one licensee in each state, reducing the need for spectral efficiency through a trunking requirement. That said, states comply and agree with the Commission's trunking requirement and understand that the number of available RF frequencies allotted to the state will not be sufficient unless used wisely.

VRS use by a state on "state use" frequencies still has all of the technical limitations of trunking as detailed in the previous section. The use of "state use" spectrum is without competition from other licensees once the state has attained substantial use status. Any requirement to apply trunking to VRS operations for "state use" spectrum will not attain the goal of making more spectrum available for additional eligible licensees, as in the "state use" spectrum there are no other eligible licensees beyond the state.

Operating under a geographic license encumbers each state to manage the operations along common borders. This has been accomplished through active coordination with other licensees, as it applies to fixed operation as well as mobile operation such as VRS. Existing VRS operation by state licensees, such as the Commonwealth of Virginia, have shown that VRS activities are compatible with adjacent state plans for use of the spectrum as fixed and mobile operations.

Most state infrastructures are wide-area operations, covering vast portions of geography. Designing a land mobile radio system to cover this vast and irregular terrain requires many fixed stations to provide mobile coverage with a public safety grade of reliability. Some of these geographic areas have very low population and are not within the coverage footprint of commercial networks. Public safety requirements are not population based, but require coverage of the full geography of the jurisdiction. Emergencies and disasters cannot be restricted to those areas where coverage can easily be provided, and do often occur in less populated areas where commercial and other methods of communication are nonexistent. While coverage in these rural areas is attainable for a vehicular unit, operation of handheld radios will not generally be able to access the fixed network. A VRS system installed in a vehicle can bridge coverage gaps inherent in expansive radio systems in a cost-effective and spectrally-efficient manner.

Although large areas within a state system may be rural, public safety services are still required to serve the resident population and for emergency and disaster response that may be required due to external actions. In these situations, particularly with a state system, resources are drawn from distance areas to converge upon an incident. When a large number of vehicles and personnel converge into an area where land mobile radio coverage is only possible with vehicle-installed subscriber units, the VRS provides the link between the first responder and the fixed radio network. These VRS units operate independently and provide decentralized frequency control.

## **Summary of Comments**

PSP has illustrated that the use of Vehicular Repeaters (VRS) is essential to many public safety communications networks. These VRS systems provide extended infrastructure coverage to handheld subscriber units operating at the fringe of the fixed infrastructure, either in rural areas or to provide in-building operation. VRS units operate in a spectrally-efficient mode by reducing the need to expand the fixed infrastructure and by recognizing multiple units at a geographic location, affiliating groups of handheld subscriber units to a single VRS unit where operationally possible. It was further shown that the single multi-frequency transmitter in a

VRS unit does not have the characteristics of a fixed trunking operation, nor do multiple VRS units that may be present at a geographic location have the networking or central control structure to operate as a trunked system.

PSP urges the Commission to find that VRS operations are exempt from the trunking requirement and that VRS is an essential component of the public safety environment at 800 and 700 MHz, including the “state use” 700 MHz spectrum.